Incorporating human perceptual expertise in face identification systems

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Australian Government
Australian Research Council

Australian Government
Department of Foreign Affairs and Trade

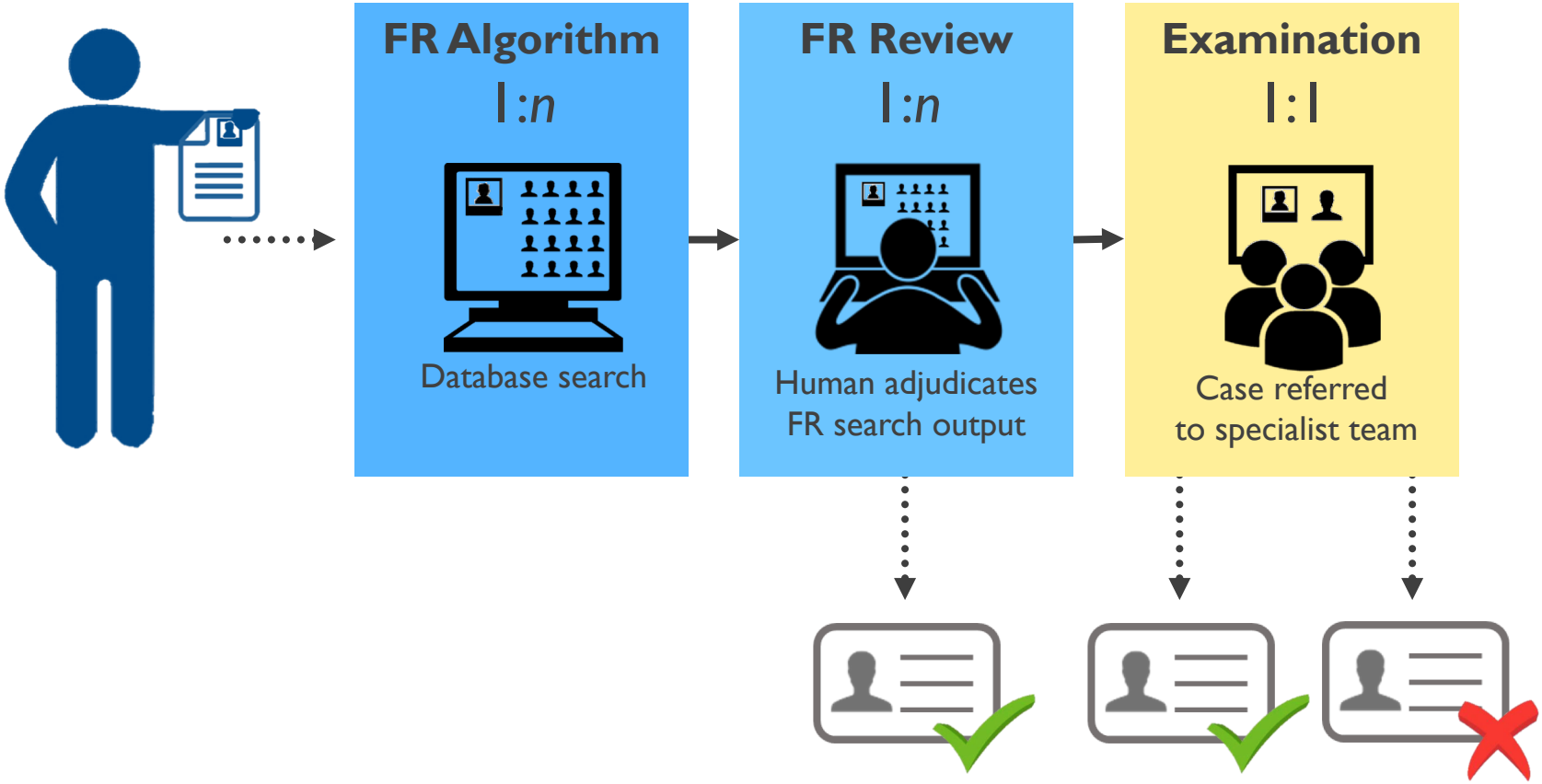
AUSTRALIAN PASSPORT OFFICE

The problem (why we need humans)

"**With good quality portrait photos … for at least 10% of images** … matches become indistinguishable from false positives, and **human adjudication becomes necessary.**"

***FRVT 2018,* Grother, Ngan & Hanaoka**

Australian passport issuance FR workflow



Towler, A., Kemp, R. I., & White, D. (2017). Unfamiliar face matching systems in applied settings. In M. Bindemann & A. M. Megreya (Eds.), *Face Processing: Systems, disorders and cultural differences*. New York: Nova Science Publishers Inc.

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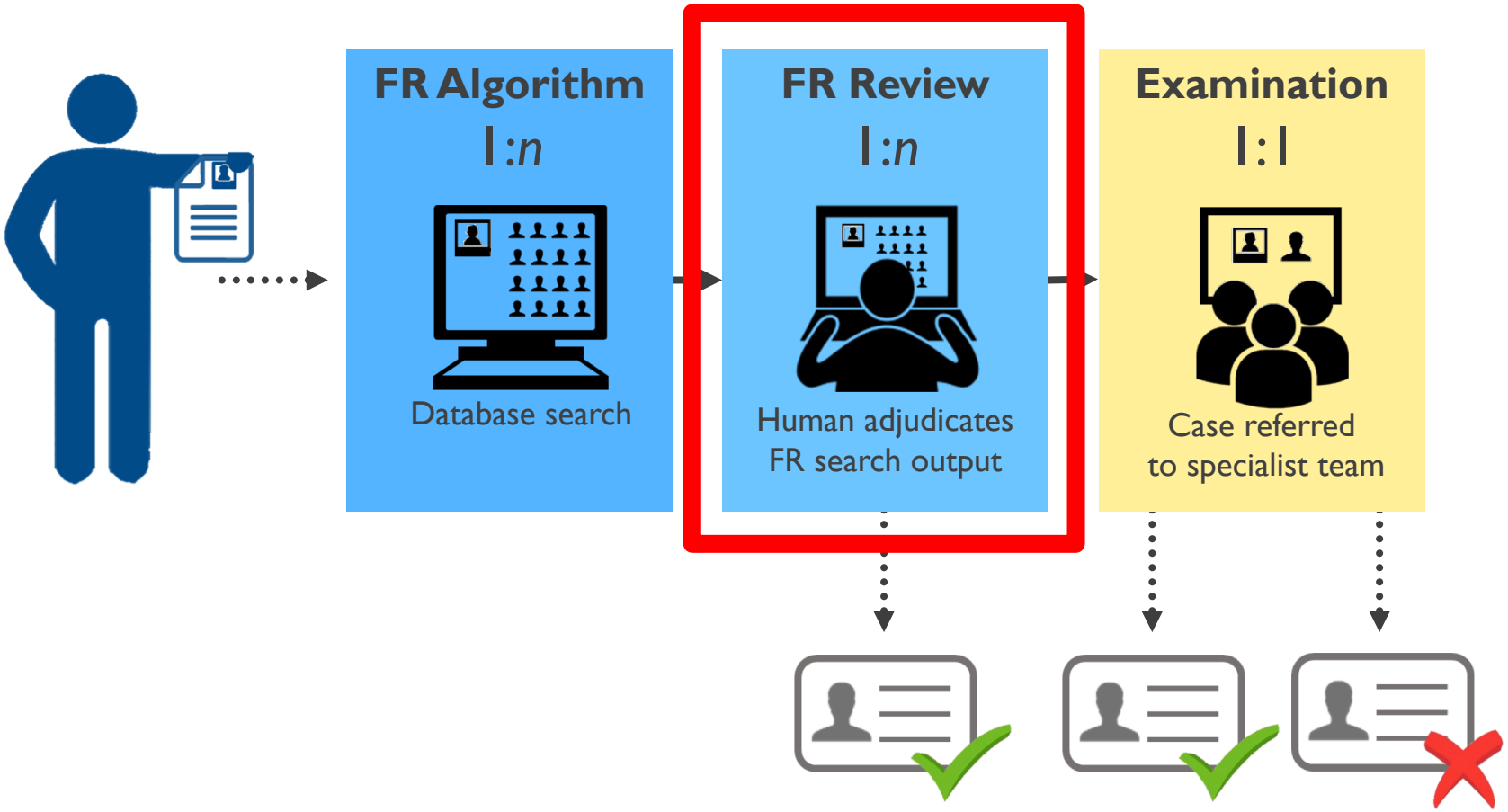
Australian passport issuance FR workflow



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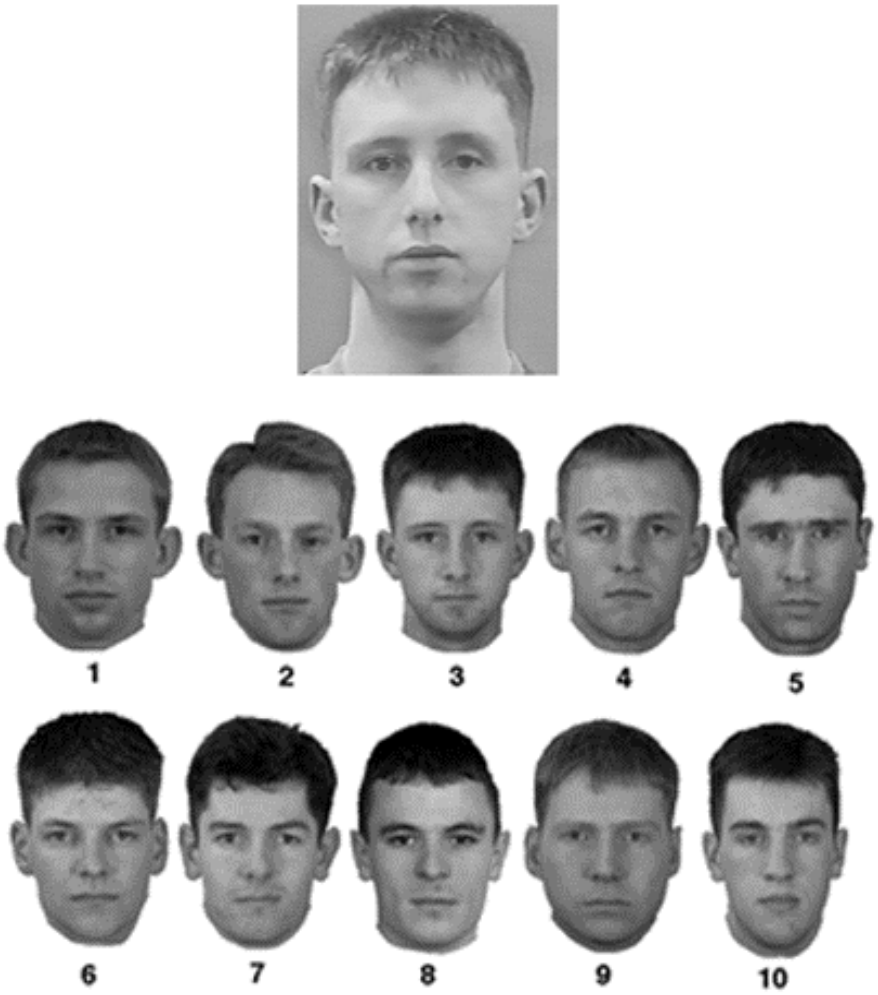
Why is ‘the problem’ a problem?



Bruce, V. et al. (1999). Verification of face identities from images captured on video. *Journal of Experimental Psychology: Applied, 5(4), 339.*

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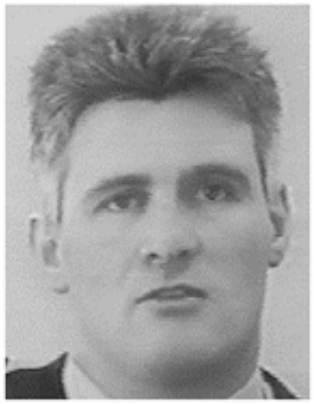

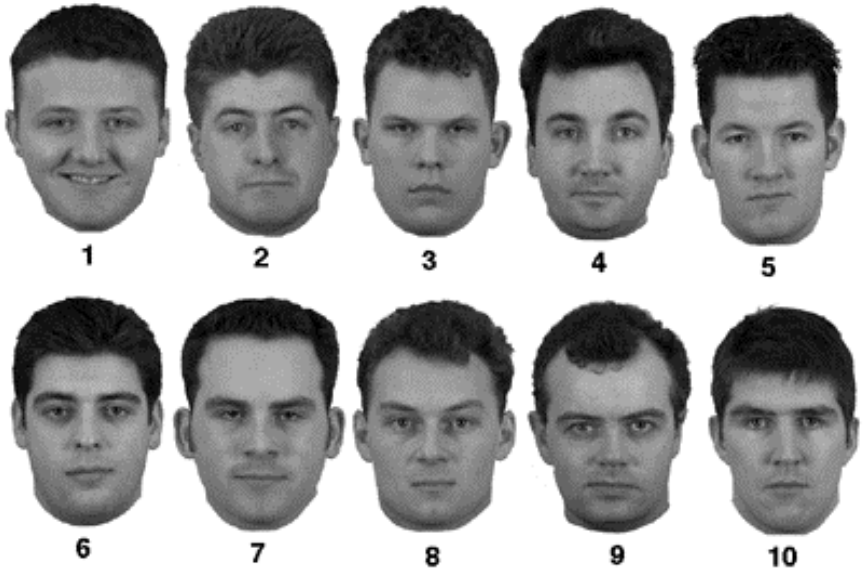

Bruce, V. et al. (1999). Verification of face identities from images captured on video. *Journal of Experimental Psychology: Applied, 5(4), 339.*

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Why is ‘the problem’ a problem?

Bruce, V. et al. (1999). Verification of face identities from images captured on video. *Journal of Experimental Psychology: Applied, 5(4), 339.*

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PLOS ONE

OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

Error Rates in Users of Automatic Face Recognition Software

David White, James D. Dunn, Alexandra C. Schmid, Richard I. Kemp

Published: October 14, 2015 • https://doi.org/10.1371/journal.pone.0139827

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White, Dunn, Schmid, Kemp (2015)

NB. Images in this slide are illustrative. Due to privacy conditions we are unable to show passport images used in this study.

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Error rates

University students = **50%**

Passport office facial review staff = **50%**

White, Dunn, Schmid, Kemp (2015)

NB. Images in this slide are illustrative. Due to privacy conditions we are unable to show passport images used in this study.

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“I think everyone in the Passport Office was surprised…

… it simply goes against your intuition”

ABC Catalyst, February 2015

Evidence-based solutions

HUMAN RESOURCE SOLUTIONS

Staff selection/ recruitment (e.g. White et al. 2015, Balsdon et al. 2018)

Training (e.g. Towler et al. 2017)

Mentorship (e.g. Dowsett & Burton, 2015)

WORKFLOW DESIGN SOLUTIONS

Response 'fusion' (e.g. White et al. 2013, Phillips et al. 2018)

Familiarization (e.g. White et al. 2014; Cavazos, Noyes & O'Toole, 2018)

Evidence-based solutions

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Error rates

University students = **50%**

Passport office facial review staff = **50%**

Identity resolution unit = 30%

White, Dunn, Schmid, Kemp (2015)

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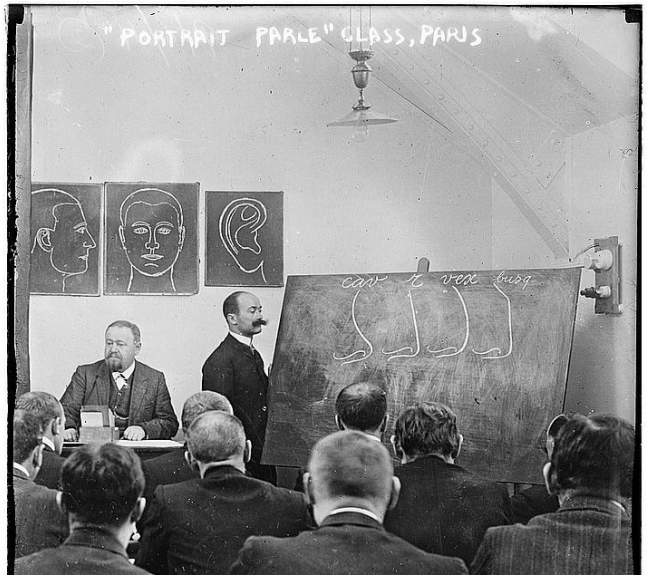
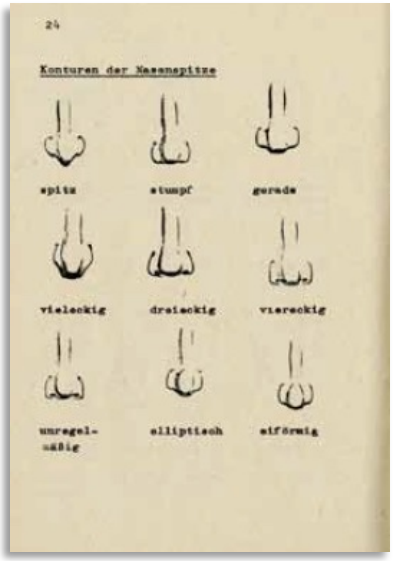
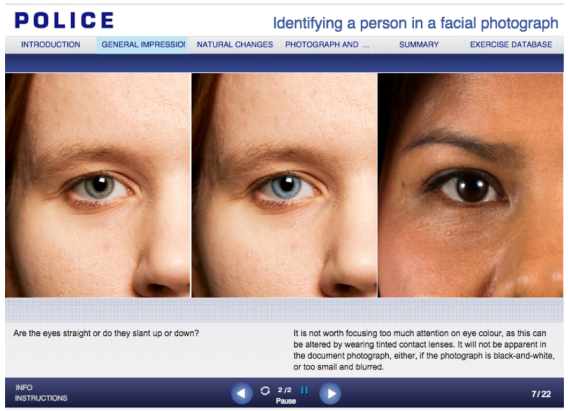
Does face identification training work?



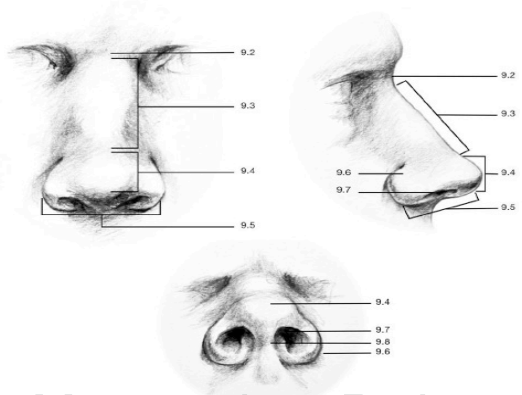
Alphonse Bertillon ~ 1890



East German Stasi ~ 1970



Finland Police 2012



London Metropolitan Police 2016

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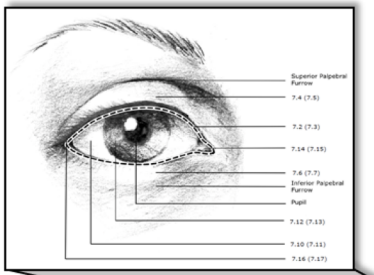
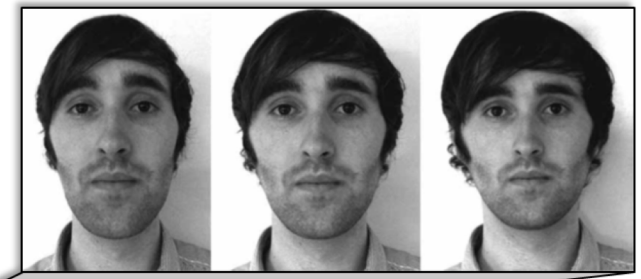
Does face identification training work?





	Country	Format	Days	Facial anatomy	Feature comparison	Photography	Practical exercises	Feedback	Error-rates	Cites empirical support for material
A	Australia	Online	1hr	✓	✓	✗	✓	✓	✗	✗
B	Finland	Online	1hr	✓	✓	✓	✓	✓	✗	✗
C	Australia	Face-to-Face	0.5	✓	✓	✓	✓	✓	✗	✗
D	UK	Face-to-Face	3	✓	✓	✓	✓	✓	✗	✓
E	Australia	Face-to-Face	0.5	✓	✓	✗	✓	✓	✗	✗
F	Australia	Face-to-Face	0.5	✓	✓	✗	✓	✓	✗	✗
G	Australia	Online	0.5	✓	✓	✓	✓	✓	✗	✗
H	USA	Face-to-Face	1	✓	✓	✓	✓	✓	✗	✗
I	USA	Face-to-Face	5	✓	✓	✓	✓	✓	✗	✗
J	Global	Face-to-Face	3	✓	✓	✓	✓	✓	✓	✗
K	Global	Face-to-Face	5	✓	✓	✓	✓	✓	✓	✗

Towler et al (forthcoming). *Plos One*.

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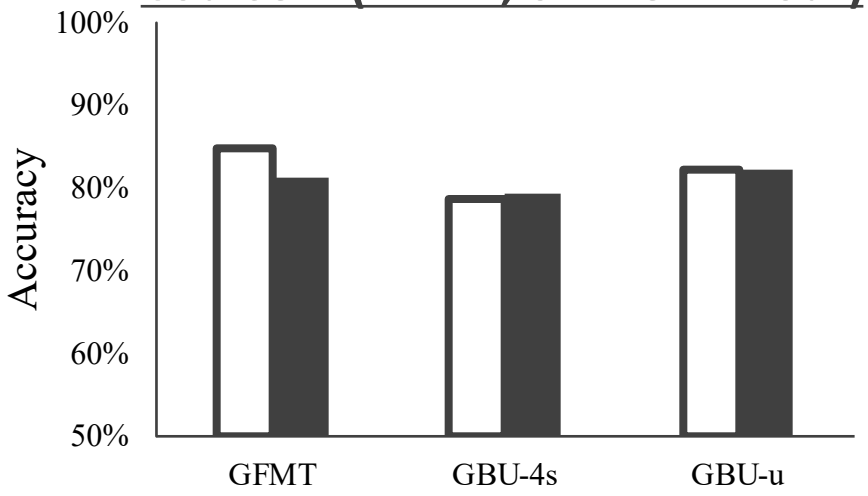
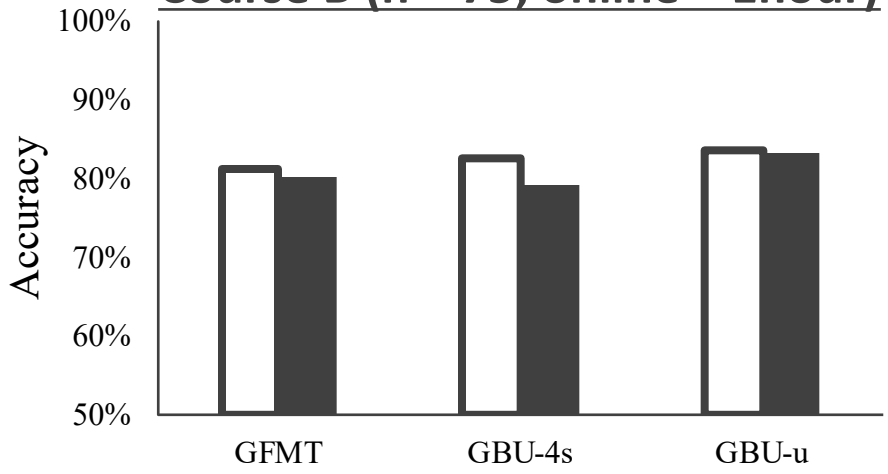
Does face identification training work?

University students

Course A (n = 77; online ~ 1hour)

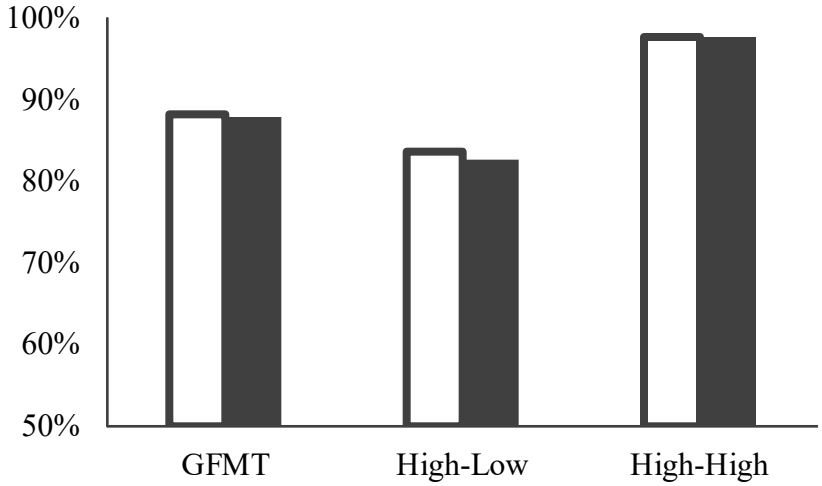


Course B (n = 75; online ~ 1hour)

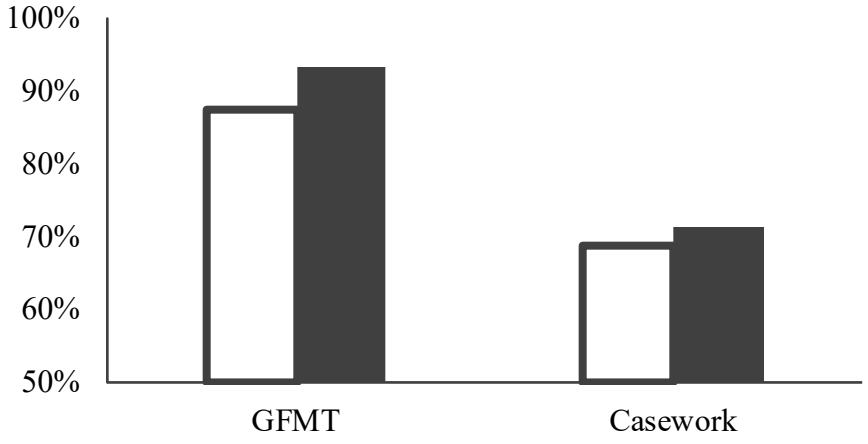


Professional practitioners

Course C (n = 236 in person, half day)



Course D (n = 32 in person, 3 days)



Towler et al (forthcoming). *Plos One*.

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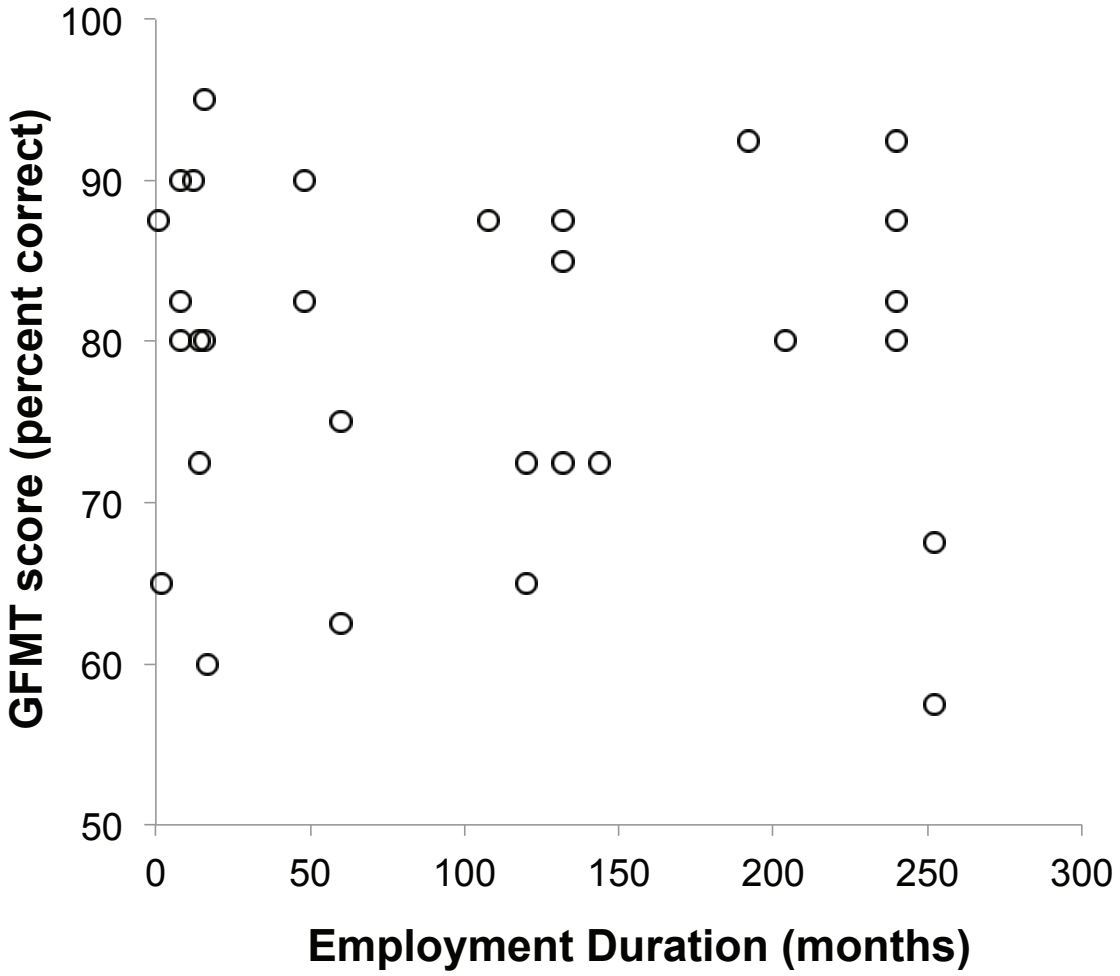
‘Select for success’: The case for staff selection



White, Kemp, Jenkins, Matheson, Burton (2014). PLOS ONE 9(8)

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Finding Australia's 'top super-recognizer'

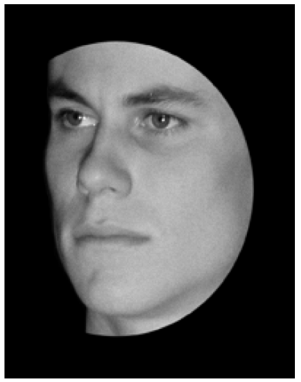
https://au.news.yahoo.com/sunday-night/a/37030676/australias-top-super-recogniser-stuns-experts-with-skills/

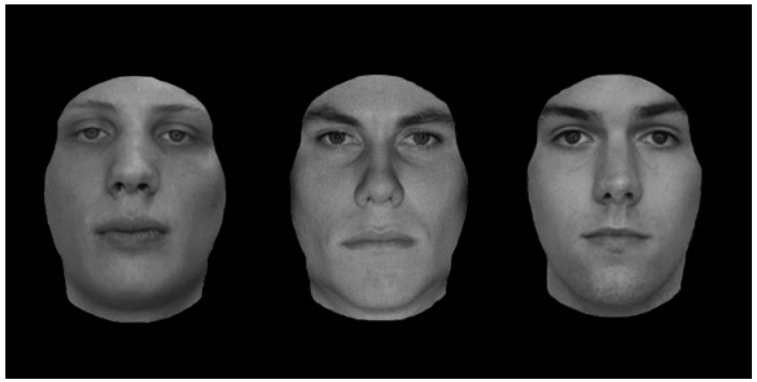
Testing the best

Super-recognizers had attained maximum 100% on at least one of standard available tests …

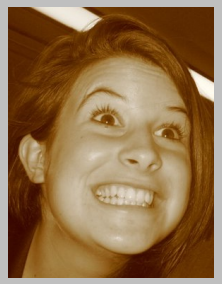
Glasgow Face Matching Test

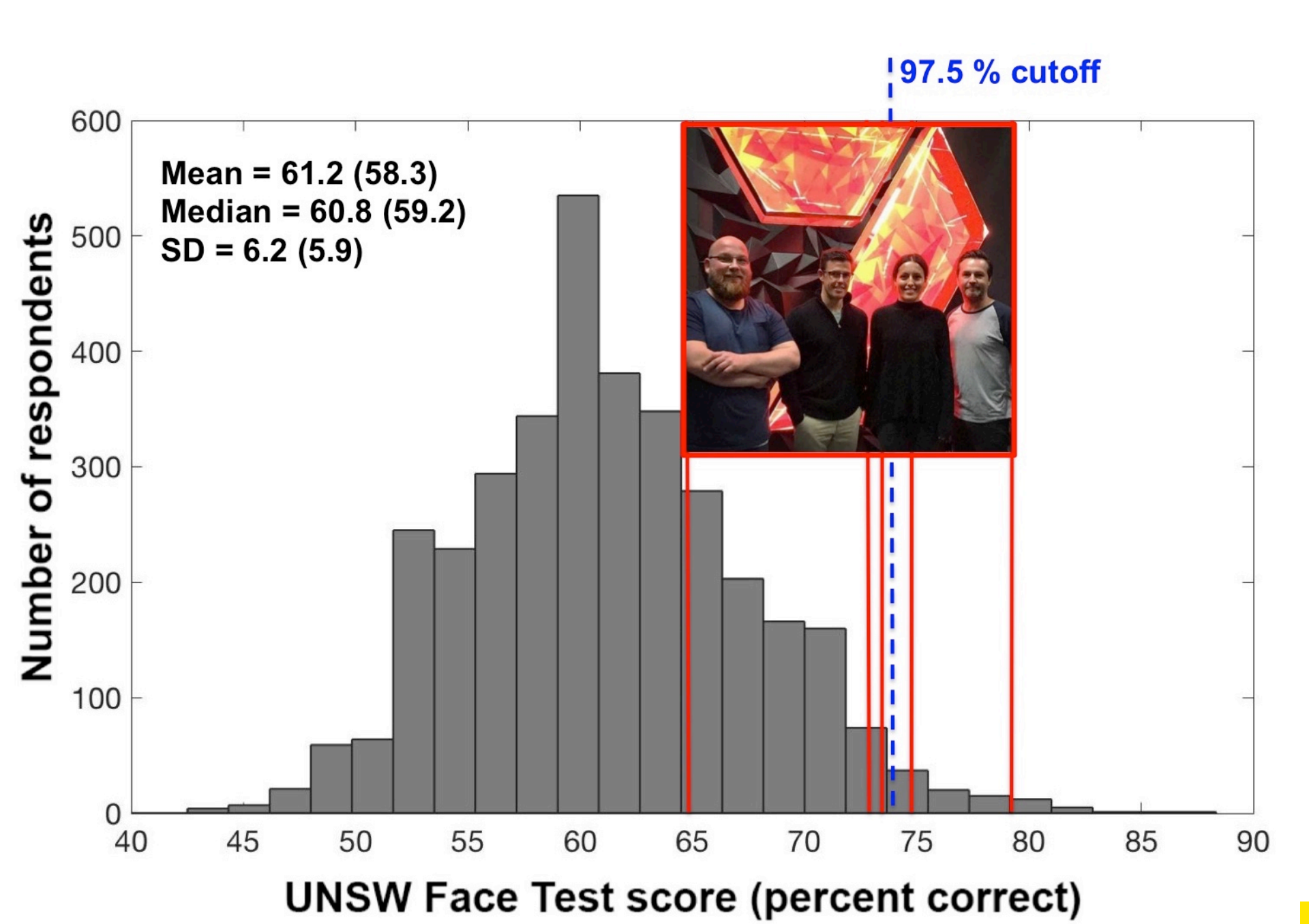
Cambridge Face Memory Test

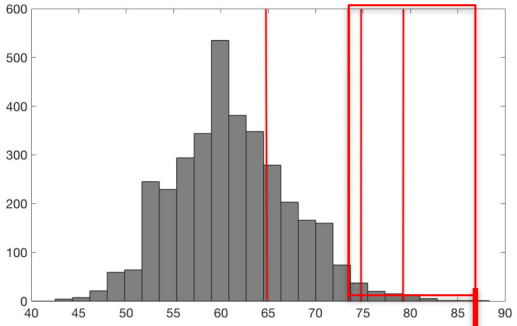




UNSW Face Test: Challenging image/ task conditions

Studio quality	Social media	Photo-ID
		


97.5 % cutoff
Mean = 61.2 (58.3)
Median = 60.8 (59.2)
SD = 6.2 (5.9)
Number of respondents
UNSW Face Test score (percent correct)
0
100
200
300
400
500
600
40
45
50
55
60
65
70
75
80
85
90

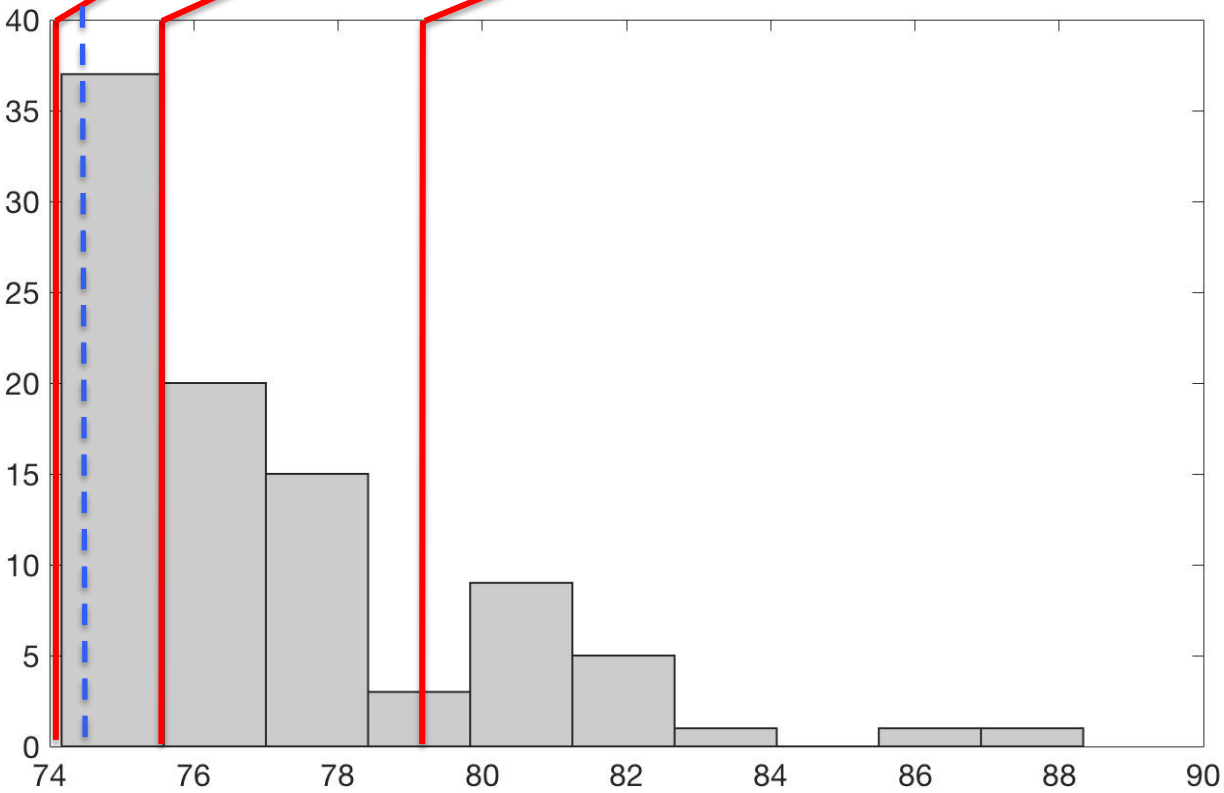


97.5 % cutoff

Rank (HC) = 95 / 3507

Rank (TI) = 58 / 3507

Rank (DB) = 19 / 3507



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UNSW Face Test: Current stats

16000 people completed

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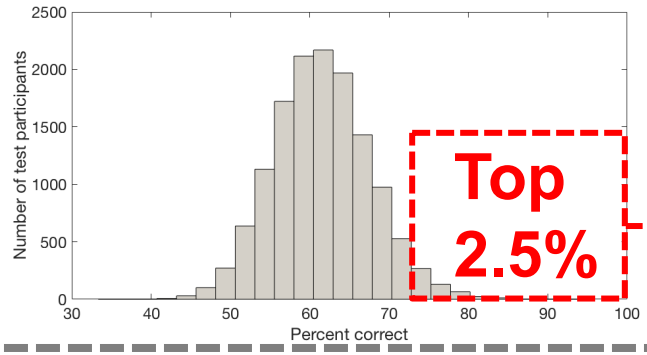
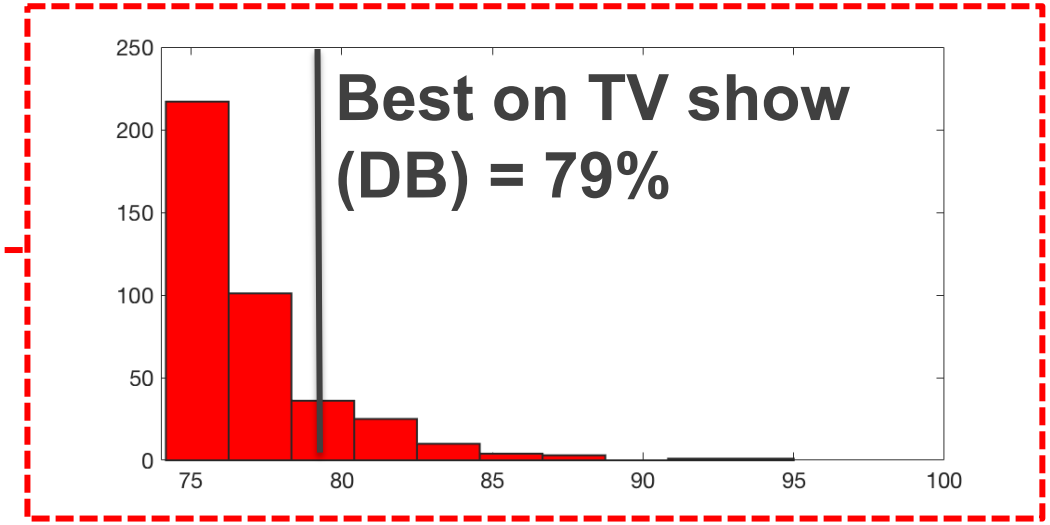
Face Test

Are you a super-recogniser?

facetest.psy.unsw.edu.au





Current maximum score = 95% (> + 5SD)

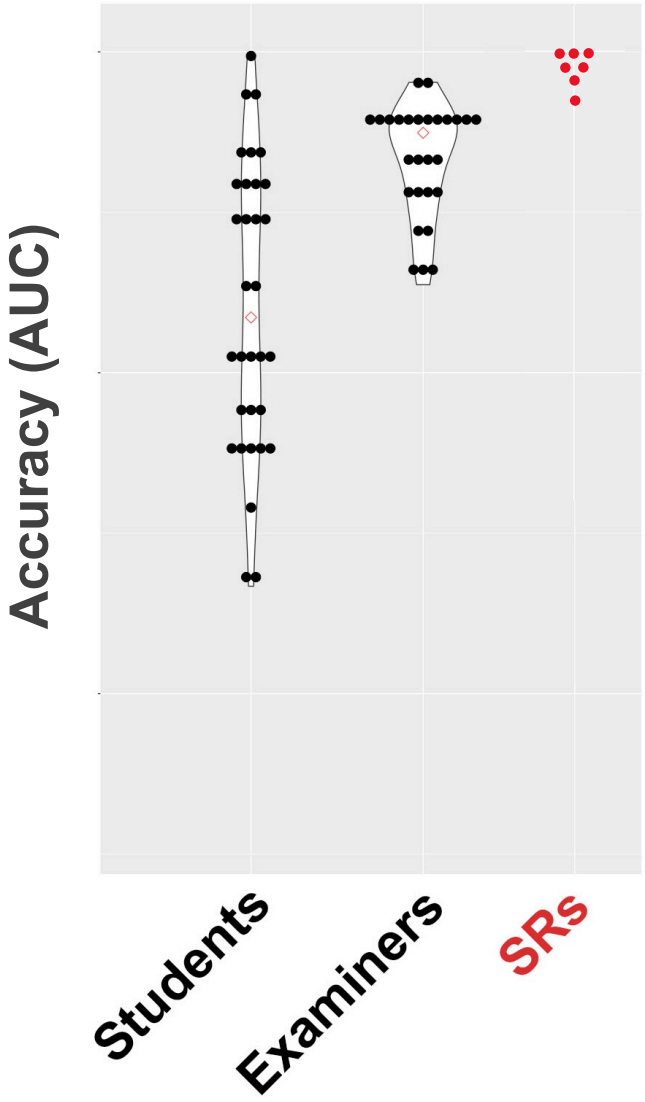
PROCEEDINGS B

rspb.royalsocietypublishing.org

Perceptual expertise in forensic facial image comparison

David White[1], P. Jonathon Phillips[2], Carina A. Hahn[3], Matthew Hill[3] and Alice J. O'Toole[3]

30 second presentation



White, Phillips, Hahn, Hill & O'Toole (2015). Proc Roy Soc

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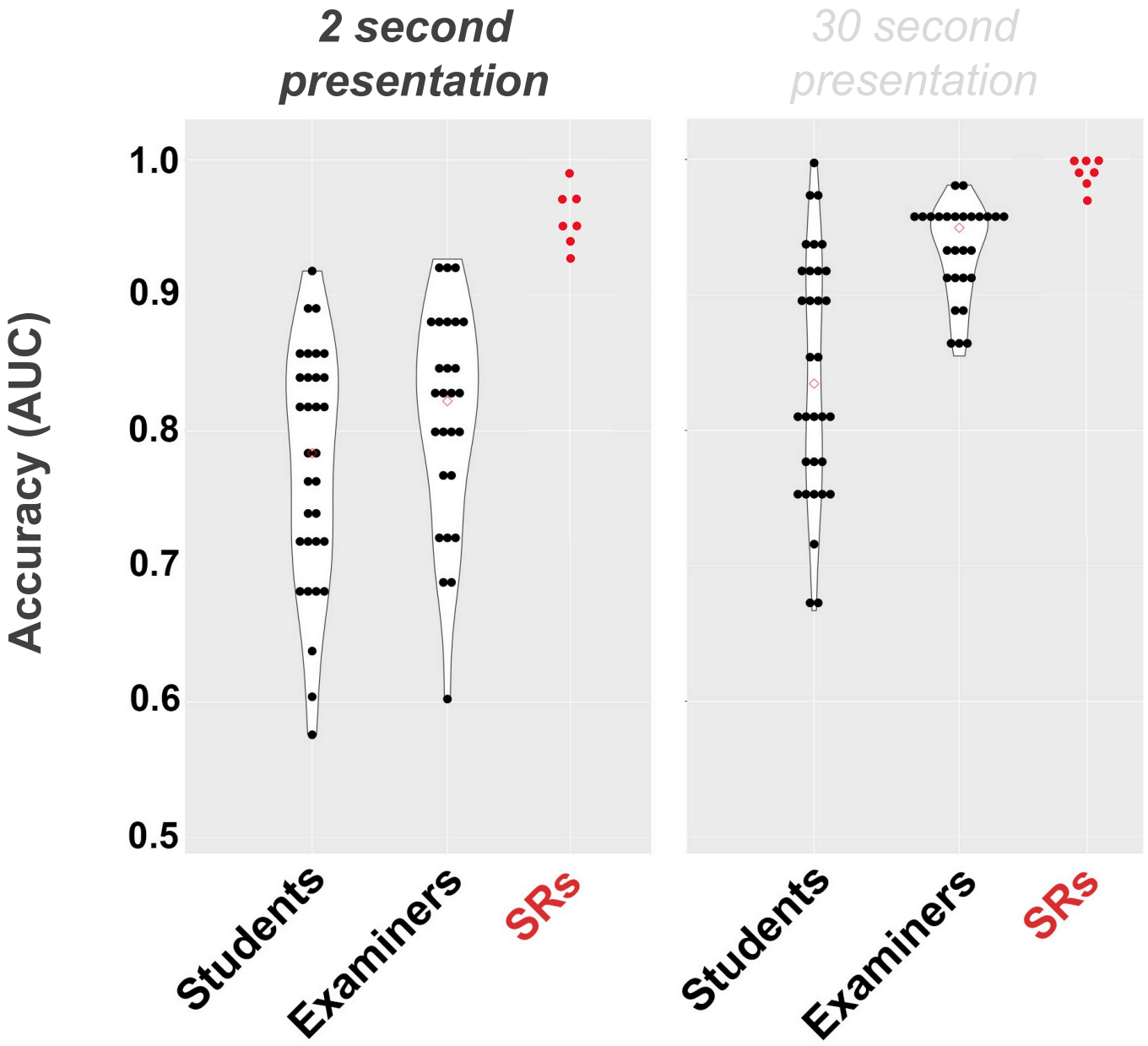

White, Dunn, Summersby, Kemp & Towler (in prep)

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Summary

- Human adjudication of FR candidate lists surprisingly error-prone

- Combination of evidence-based solutions can be used

- Selection/ recruitment provides key advantages over other methods (e.g. training)

- However, selection is not straightforward and large gains should not be expected based on single test

Alice Towler
UNSW Science

James Dunn
UNSW Science

Gary Edmond
UNSW Law

Richard Kemp
UNSW Science

Alice O'Toole
University of Texas

Jonathon Phillips
NIST

Michael Matheson
Australian Passport Office

Shashi Samprathi
Australian Passport Office

Andrew Burr
Westbourne Group

Thank you for listening!

Unfamiliar Face Identification Group Meeting 2019
UNSW Sydney, 7-8 February

ufig

2019

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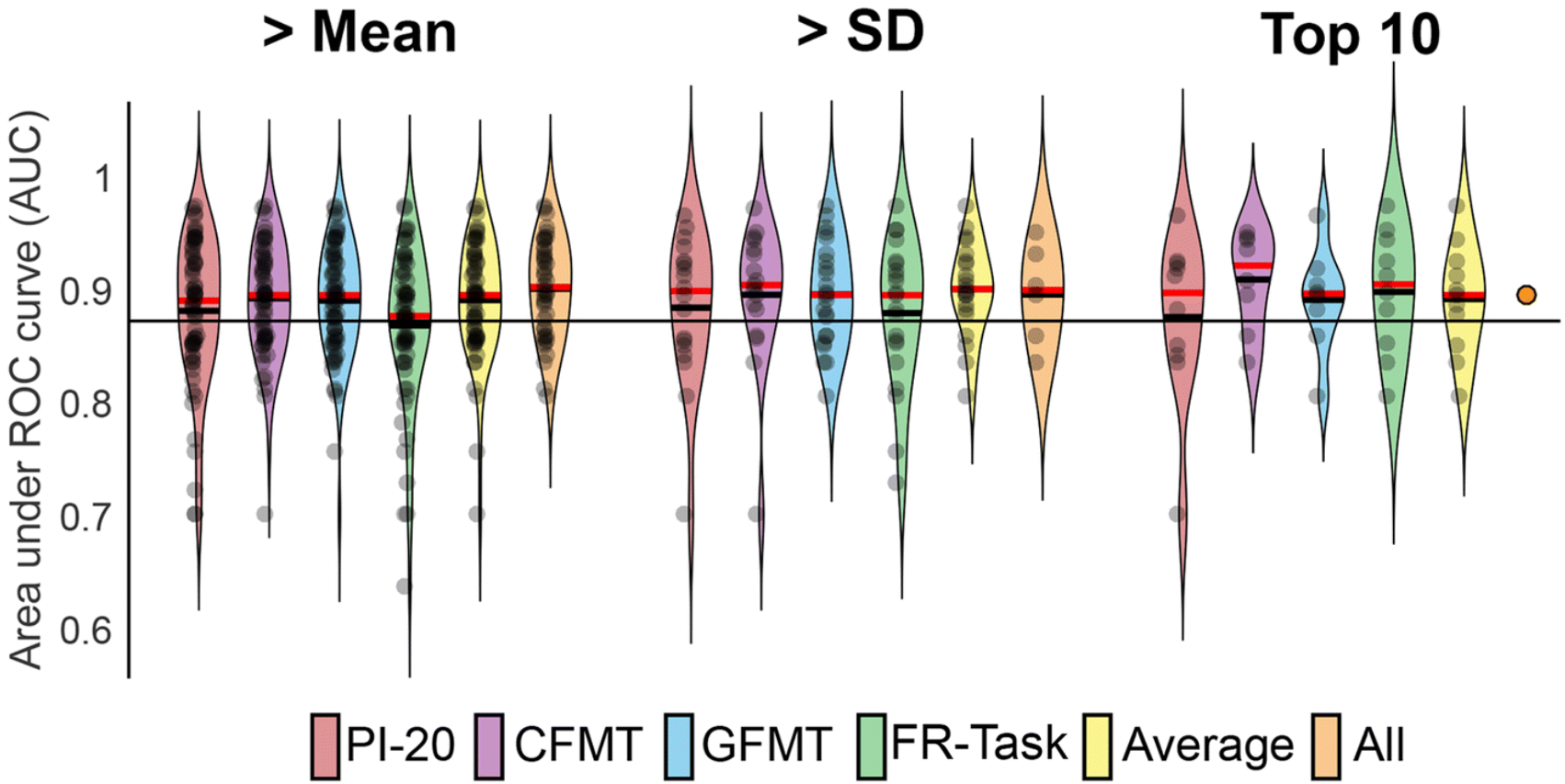
Final word of warning

Simulated recruitment process (n = 100)



Balsdon et al. (2018)

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facetest.psy.unsw.edu.au